REMARKS

Claims 1-3 and 5-22 will now be active in this application. Claims 2, 6-15, 17 and 19-21 stand withdrawn from consideration.

Applicants respectfully request reconsideration of the application, as amended, in view of the following remarks.

The present invention as set forth in **Claim 1** relates to a positive electrode active material which comprises a lithium-cobalt composite oxide represented by the formula $Li_pCo_xM_yO_zF_a$ (wherein M is a transition metal element other than Co or an alkaline earth metal element, $0.9 \leq p \leq 1.1$, $0.980 \leq x \leq 1.000$, $0 \leq y \leq 0.02$, $1.9 \leq z \leq 2.1$, $x+y=1$ and $0 \leq a \leq 0.02$) and comprising a mixture comprising substantially spherical first particles of lithium-cobalt composite oxide having such a sharp particle size distribution that the volume basis cumulative size D10 is at least 50% of the average particle size D50, and the volume basis cumulative size D90 is at most 150% of the average particle size D50, and second particles of lithium-cobalt composite oxide filling the space among the above lithium-cobalt composite oxide particles, in a mass ratio of first particles/second particles of from 1/2 to 9/1;

wherein the first particles are large particles having an average particle size D50 of from 7 to 20 μm, and the second particles are small particles having an average particle size of from 10 to 30% of D50 of the first particles; and that an aspect ratio of the first particles is from 2/1 to 1/1.

By mixing the above substantially spherical first particles of a lithium' cobalt composite oxide having the above predetermined sharp particle size distribution, and the above second particles of a lithium-cobalt composite oxide filling the space among the first particles, in the above predetermined mixing ratio, it becomes possible to accomplish the object of the present invention for the first time, namely, to obtain a positive electrode active

material having a compacted dense structure and a large volume capacity density and press density (see page 5, lines 9 to 26 of the present specification).

One feature of the positive electrode active material of the present invention resides in that this material comprises substantially spherical first particles of a lithium-cobalt composite oxide which has a sharp particle size distribution attributable to a predetermined particle size distribution, and second particles of a lithium-cobalt composite oxide filling the space among the above lithium-cobalt composite oxide (first particles).

The Examiner acknowledges that Moriuchi et al fail to disclose the claimed aspect ratio. However, the Examiner concludes that Moriuchi et al has an aspect ratio of 1/1 because there is no other disclosure and she assumes that the particles are spherical because they are only defined using the diameter. The Examiner states "This expectation can be made, as Moriuchi et al only defines the particles with respect to the diameter, suggesting that the particle is spherical." in the final Office action, at page 4, lines 17 to 18. However, although in Moriuchi et al., the diameter pointed out by the Examiner is limited in paragraph [0023], there is no description about the shape of the particles. The diameter of the particles of the present invention being close to that of Moriuchi et al. does not always mean that the aspect ratio of the particles of the present invention is equivalent to the aspect ratio of the particles of Moriuchi et al. Further, the shape of the particles, namely, the proportion of the major axis to the minor axis is important. Besides, the diameter of the particles described in Moriuchi et al. is measured by laser beam scattering, as described in paragraph [0023]. On the other hand, the aspect ratio of the present invention is obtained by the average of the proportion of the major axis to the minor axis (aspect ratio) of 500 spherical particles at each magnification (see page 29, lines 1 to 5), and it is different from a value obtained from the diameter described in Moriuchi et al.

Further, the Examiner also states "Moriuchi et al suggests that the particles have a spherical shape, as the projection of light on the particles is used to obtain a circular image, wherein the diameter is used to measure a spherical equivalent diameter" in the final Office Action, at page 4, lines 18 to 21. However, "the spherical equivalent diameter" of Moriuchi et al. does not mean that the described active material is spherical and means that in order to measure the diameter, particles to be measured are **assumed** to be spherical. Thus, it does not mean that actual particles measured in Moriuchi et al. are spherical.

For the reasons stated above, although the diameter is described in Moriuchi et al., Applicants disagree with the Examiner's position that the description of the diameter suggests the aspect ratio, and the aspect ratio can be predicted. Namely, since Moriuchi et al. neither describes nor suggests the aspect ratio, the present invention is not obvious from Moriuchi et al. and has patentability.

The description in paragraph [0023] of Mouriuchi et al. is that at the time of measuring a particle size distribution, whether particles to be measured are spherical or not, the particle size distribution is measured by assuming the particles to be spherical. Therefore, in Mouriuchi et al., particles to be measured need not to be spherical, and there is no evidence that the particles in Mouriuchi et al. are spherical.

Further, there is no description about the shape and the aspect ratio of the particles in Mouriuchi et al. Besides, there is also no description about physical properties to be reference of the shape and the aspect ratio. Since shape and aspect ratio of the particles and their physical properties are not described in Mouriuchi et al., the particles described in Mouriuchi et al. are not spherical and not included in the aspect ratio of the present invention.

By employing a lithium-cobalt composite oxide having the first particles of which particle size, particle size distribution and aspect ratio are limited and the second particles of which particle size is limited, it is possible to obtain a lithium-cobalt composite oxide having a higher press density and an improved packing function, as compared to the lithium-cobalt composite oxide of Mourichi et al. wherein only particle sizes of the large particles and the small particles are limited.

By employing particles having a large particle size of which the aspect ratio is close to 1 and the shape is substantially spherical, a lithium-cobalt composite oxide having a higher press density and an improved packing function can be obtained, as compared to the lithium-cobalt composite oxide of Mourichi et al. wherein particles having a specific large particle size and small particles having a specific small particle size are simply mixed.

The Examiner has cited Nakamura et al only to show that a narrow particle size distribution is desirable for higher packing density. Nakamura et al do not cure the defects of Moriuchi et al.

Matsubara discloses a lithium- nickel-cobalt composite oxide as a positive electrode active material. Matsubara discloses that the average particle size of this positive electrode active material is preferably from 5 to 30 μm (paragraph 0026). It further describes that this positive electrode active material is made of particles having limited particle size distributions with 10% of the particle size distribution being 0.5D or higher and 90% being 2D or lower, relative to the average secondary particle size D (paragraph 0017).

However, Moriuchi et al, Nakamura et al and Matsubara et al, neither disclose nor suggest the constitution of the present invention wherein a lithium-cobalt composite oxide (first particles) having a predetermined particle size distribution and a lithium-cobalt

composite oxide (second particles) filling the space among the lithium-cobalt composite oxide (first particles) are mixed in a predetermined mixing ratio to form a mixture. Further, Moriuchi et al, Nakamura et al and Matsubara et al, neither disclose nor suggest the technical concept of realizing a compacted dense structure and a large volume capacity density and press density by using the positive electrode active material having such constitution.

Further, **it is the combination of the various limitations of Claim 1 that provides a superior positive electrode active material as shown in the Examples of the specification.**

With the particles described in Moriuchi et al, Nakamura et al and Matsubara et al, simply having the predetermined particle size and particle size distribution, it is **impossible** to obtain a positive electrode active material according to the present invention, having a large volume capacity density. This will be evident from the comparison between Examples 1 to 4 and Examples 5 and 6 (Comparative Examples) using only component A or B, respectively, of the present specification (please see the data in the following Table 1 extracted from the data of the present specification).

Table 1: The comparison of the apparent density after pressing

		The mixture ratio of the first particles and the second particles (the basis of mass)	The apparent density after pressing (g/cm3)	The initial weight capacity density (mA/g)
Example 1	Present invention	A:B = 60:40	3.20	159
Example 2	Present invention	A:B = 80:20	3.23	160
Example 3	Present invention	A:B = 40:60	3.13	160
Example 4	Present invention	E:B = 60:40	3.14	160
Example 5	Comparative example	A = 100	2.950	160
Example 6	Comparative example	B=100	2.78	159

With regard to the dependent claims, for example Claims 3 and 22, the Examiner simply picks and chooses from the references she cites to show all of the limitations. However, the Examiner uses impermissible hind sight. It is unobvious to combine all the claimed limitations to achieve a positive electrode active material having a compacted dense structure and a large volume capacity density and press density.

For example Moriuchi does not disclose the press density, surface area and half value width of diffraction peak. Applicants disagree with the Examiner's position that just because the Matsubara may use a similar material that it would be inherent to have a half value of diffraction peak as claimed. Also why would one of ordinary skill in the art change the properties of the Moriuchi particles to be those of the Matsubara particles, specifically surface area and press density. Thus, Claims 3 and 22 contain allowable subject matter.

Therefore, the rejections of the claims under 35 U.S.C. § 103(a) over Moriuchi et al (JP 2003-257416), Nakamura et al (US 6,103,213) and Matsubara et al (US 2001/0010807) is believed to be unsustainable as the present invention is neither anticipated nor obvious and withdrawal of these rejections is respectfully requested.

This application presents allowable subject matter, and the Examiner is kindly requested to pass it to issue. Should the Examiner have any questions regarding the claims or otherwise wish to discuss this case, he is kindly invited to contact Applicants' below-signed

representative, who would be happy to provide any assistance deemed necessary in speeding this application to allowance.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.
Norman F. Oblon

Kirsten Gruneberg

Kirsten A. Gruneberg, Ph.D.
Registration No.: 47,297

Customer Number
22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
NFO:KAG:
(OSMMN 02/07)